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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ROBERT KOPESKY and THOMAS A. RUSZKAY

Appeal 2009-009621
Application 10/521,886
Technology Center 1600

Decided: February 12, 2010

Before TONI R. SCHEINER, JEFFREY N. FREDMAN, and
STEPHEN WALSH, *Administrative Patent Judges*.

WALSH, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134(a) involving claims to a process for producing microcrystalline cellulose, and to microcrystalline cellulose produced by the process. The Patent Examiner rejected the claims for obviousness. We have jurisdiction under 35 U.S.C. § 6(b). We affirm-in-part.

STATEMENT OF THE CASE

The invention “relates to processes for production of microcrystalline cellulose, particularly in simplified, continuous modes.” (Spec. 1:13-14.) According to the Specification, the invention produces microcrystalline cellulose (aka MCC) “more efficiently and simply, and therefore at lower cost.” (*Id.* at 3:26-30.)

Claims 1-31, which are all the pending claims, are on appeal. The representative and separately argued claims read as follows:

1. A process for producing microcrystalline cellulose, comprising subjecting to a high shear treatment at elevated temperature, a reaction mixture comprising a cellulose material, an active oxygen compound and water for a time effective to depolymerize the cellulose material.
- 3.¹ The process of claim 1 wherein the active oxygen compound is hydrogen peroxide and the reaction mixture is subjected to the high shear treatment in an extruder system including a barrel and a product outlet.
9. The process of claim 3 wherein the hydrogen peroxide comprises an aqueous solution and is admixed with the cellulose material prior to introduction of the cellulose material to the extruder system.
10. The process of claim 3 wherein the hydrogen peroxide comprises an aqueous solution and is introduced into the extruder system after introduction of the cellulose material.
14. The process of claim 3 wherein the extrusion system comprises a twin screw extruder, the cellulose material comprises about 30% to about 50% by weight of the reaction mixture, and the hydrogen peroxide comprises about 0.1% to about 10% by weight of the reaction mixture, on a 100% active basis of hydrogen peroxide.

¹ Claim 3 is not separately argued, but we include it for clarity because its dependent claims 9, 10 and 14 are separately argued.

16. The process of claim 14 wherein the extrusion is continuous and residence time is 15 minutes or less.
17. The process of claim 14 wherein the extrusion is continuous and residence time is 5 minutes or less.

The Examiner rejected the claims as follows:

- claims 1-17, 20, 22-24, 26 and 28 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of Hanna,² Schaible,³ and Trusovs,⁴ and
- claims 18-21, 25-27 and 29-31 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of Hanna, Schaible, Trusovs, and McGinley.⁵

² Milford Hanna et al., *Production Of Microcrystalline Cellulose By Reactive Extrusion*, US 6,228,213 B1, issued May 8, 2001.

³ David Schaible et al., *Treatment Of Pulp To Produce Microcrystalline Cellulose*, WO 01/02441 A1, published Jan. 11, 2001.

⁴ Sergejs Trusovs, *Microcrystalline Cellulose*, US 6,392,034 B1, issued May 21, 2002.

⁵ Emanuel J. McGinley et al., *Fat-Like Bulking Agent For Aqueous Foods Comprising Microcrystalline Cellulose And A Galactomannan Gum*, US 5,192,569, issued Mar. 9, 1993.

Claims 2-8, 11-13, 18-23 and 24-31 were not argued separately and stand or fall with claim 1. Claim 15 was not argued separately and stands or falls with claim 14. 37 C.F.R. § 41.37(c)(1)(vii).

OBVIOUSNESS

The Issue

The Examiner's position is that Hanna taught an extrusion method for making MCC that differs from Appellants' method only because Hanna did not include an active oxygen material during the extrusion process. (Ans. 4-5.) Hanna taught using hydrogen peroxide, an active oxygen material, to bleach the MCC after extrusion. (*Id.*) The Examiner found that Schaible taught a one-step process for making MCC using hydrogen peroxide for both hydrolysis and bleaching, but did not disclose using an extruder. (*Id.* at 5.) The Examiner found that one of ordinary skill in the art at the time of the invention would have been motivated to use Schaible's one-step mixture in Hanna's extruder method "because the extruder method has a shorter reaction time than conventional methods and the use of hydrogen peroxide for hydrolysis also bleaches the material at the same time, so there is no need for a separate bleaching step." (*Id.*)

Appellants contend that "obtaining a reduction in reaction time cannot be a motivation for a skilled person to modify Schaible et al. since the Examiner's alleged reduction in reaction time is pure speculation." (App. Br. 11.) According to Appellants, the Schaible "reaction is already performed at high temperature," and Hanna "nowhere teaches that increasing pressure will decrease reaction time." (*Id.* at 12.) The Examiner's "conclusion is based on the underlying assumption that the acid

hydrolysis process of Hanna et al. is interchangeable with the active oxygen reaction of Schaible et al.,” but “this underlying assumption is incorrect.” (*Id.* at 13.)

According to Appellants, “there is no reasonable expectation of eliminating a subsequent bleaching step.” (*Id.* at 15.) “A skilled person would . . . not consider an active oxygen treatment as in Schaible . . . to be interchangeable with the acid hydrolysis step of Hanna since active oxygen treatment results in a different chemical reaction than acid hydrolysis, namely, oxidation, and thus will provide different reaction products than are obtained by acid hydrolysis.” (*Id.* at 15.) “This would lead a skilled person to conclude that the active oxygen treatment should not be substituted for, or added to, the acid hydrolysis step of Hanna . . . since the effect . . . would be unpredictable.” (*Id.* at 16.)

Appellants further argue the invention provides a significant, unexpected advantage compared to conventional acid hydrolysis. (*Id.* at 17.) That is, Specification Example 2 and Table 2 are said to show a significantly lower degree of polymerization than obtained by conventional acid hydrolysis. (*Id.*)

The issues with respect to this rejection are:

have Appellants shown that a person of ordinary skill in the art would not have recognized a shorter processing time, or the elimination of a separate bleaching step, as a reason to combine the Hanna and Schaible teachings;

have Appellants established that the different chemistries used in the Hanna and Schaible processes would have dissuaded a person of ordinary skill in the art from substituting Schaible’s acid plus active oxygen agent

chemistry into Hanna's acid extruder process, or from adding Schaible's active oxygen agent to Hanna's acid treatment; and

have Appellants established a significant unexpected result?

Findings of Fact

1. Hanna titled its patent "Production of Microcrystalline Cellulose by Reactive Extrusion." (Hanna, Title.)
2. Hanna described the process as involving "feeding cellulose into an extruder with an acid solution," in which "[t]he screw is rotated so as to pressurize the cellulose, and the cellulose undergoes acid hydrolysis and forms microcrystalline cellulose." (*Id.*, Abstract.)
3. Hanna taught that the acid and cellulose of cellulose-containing material could be premixed and then fed through the extruder, or alternatively both could be simultaneously fed into the extruder. (Final Rej. 4, *citing* Hanna 3:34-39.)
4. Hanna taught that the temperature of the extruder barrel was preferably about 80°C to 200°C, and most preferably 140°C. (*Id.*, *citing* Hanna 3:60-65.)
5. Hanna disclosed that different heating regimes affect the resulting particle size of the MCC product. (*Id.*, *citing* Hanna 5:57-58; *see also*, Hanna 3:50-55.)
6. Hanna disclosed measured a level-off degree of polymerization of 220 for wood-cellulose microcrystals. (*Id.*, *citing* Hanna 5:66-6:3.)
7. Hanna disclosed that the MCC could be manufactured using single or twin screw extruders. (*Id.*, *citing* Hanna 5:32-33.)

8. Hanna taught that the product MCC can be bleached with hydrogen peroxide. (*Id.*, *citing* Hanna 4:44-46.)
9. Schaible's Abstract states:

In one embodiment of the invention is disclosed a process for the production of microcrystalline cellulose comprising hydrolyzing pulp with a sufficient amount of active oxygen in an acidic environment in a one step process: and recovering the microcrystalline cellulose; wherein said recovered microcrystalline cellulose has a color lightness (L*) greater than the color lightness (L*) of the pulp starting material.
10. Schaible taught that the method simultaneously hydrolyzed and bleached the starting material, producing a high grade MCC product. (Ans. at 5, *citing* Schaible 2:20-24.)
11. Schaible taught that hydrogen peroxide was a specific agent suitable for providing active oxygen. (*Id.*, *citing* Schaible 6:15.)
12. Schaible taught that optimum heated and pressurized conditions could be ascertained by one skilled in the art. (*Id.*, *citing* Schaible 7, fourth paragraph.)
13. Schaible's method resulted in MCC having a degree of polymerization as low as 208. (*Id.*, *citing* Schaible's Example 17.)

Principles of Law

A rejection for obviousness must include "articulated reasoning with some rational underpinning to support the legal conclusion." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007), quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). "The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR*, 550 U.S. at 416.

[E]ven though applicant's modification results in great improvement and utility over the prior art, it may still not be patentable if the modification was within the capabilities of one skilled in the art, unless the claimed ranges "produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art."

In re Huang, 100 F.3d 135, 139 (Fed. Cir. 1996) (citations omitted).

"[W]hen unexpected results are used as evidence of nonobviousness, the results must be shown to be unexpected compared with the closest prior art."

In re Baxter Travenol Labs., 952 F.2d 388, 392 (Fed. Cir. 1991).

Analysis

A. The Rejection over Hanna, Schaible, and Trusovs

Claims 1, 9, and 10

We agree with the Examiner's findings on the scope and content of Hanna's disclosure. We agree with the Examiner's finding that the difference between Hanna's process and the process recited in claim 1 is that Hanna taught using an active oxygen material to bleach the MCC after the MCC had been extruded, not during the extrusion process as Appellants now claim. We agree with the Examiner's finding that Schaible taught using an active oxygen material in a one-step process to both hydrolyze (depolymerize) and bleach MCC. We agree with the Examiner's finding that a person of ordinary skill in the art would have been motivated to adapt Hanna's extruder hydrolysis process to use Schaible's one-step approach that combined hydrolysis and bleaching.

We are not persuaded that the Examiner's reasoning is mere speculation. Appellants recognize that Hanna "teaches that use of high shear

forces applied by the extruder may reduce the reaction time of an acid hydrolysis process” (App. Br. 13.), and agree that Schaible taught optimizing (*id.*). Even if the combined process would not have been significantly shorter, and Appellants provide no evidence that that is so, the combined process would still have had the advantage of eliminating the extra bleaching step.

Appellants argue that the Examiner’s “conclusion is based on the underlying assumption that the acid hydrolysis process of Hanna et al. is interchangeable with the active oxygen reaction of Schaible et al.,” but “this underlying assumption is incorrect.” (*Id.* at 13.) We do not agree that the Examiner found one of skill in the art would eliminate acid from the process, and replace Hanna’s acid with Schaible’s active oxygen agent. Both Hanna and Schaible used acid.

Appellants’ argument that Hanna’s acid treatment “is not the chemical equivalent of treatment with an active oxygen compound as in Schaible” (*id.* at 13), does not persuade us of error by the Examiner. Both Hanna and Schaible disclosed depolymerization methods that included acid. The Examiner identified the difference in chemistry as a basis for concluding that combining Hanna’s extruder acid hydrolysis process with Schaible’s acid hydrolysis and active oxygen bleaching process would have been expected to make the process faster and/or simpler.

Specification Example 2 and Table 2 are said to show a significantly lower degree of polymerization than obtained by conventional acid hydrolysis. (*Id.*) Appellants have not established that the lower degree resulting from their method is any different from what one of skill in the art would have expected as the additive effects of combining the Hanna and

Schaible methods of depolymerization. Appellants give no explanation that the result was a difference in kind, rather than an expected difference in degree. *See Huang*, 100 F.3d at 139.

Claim 9 further defines the process by mixing hydrogen peroxide with cellulose before putting the cellulose in the extruder. The Examiner relied on Hanna's explicit disclosure of mixing acid with cellulose before loading the extruder. (FF3.) We find that explicit disclosure is sufficient evidence to support the Examiner's conclusion that it would have been obvious to mix the hydrogen peroxide with the acid and cellulose before loading the extruder. Thus, we do not agree with Appellants that the Examiner failed to show this feature was taught or suggested by the prior art. (App. Br. 18.)

Claim 10 further defines the process by adding hydrogen peroxide after putting the cellulose into the extruder. Appellants argue that the Examiner did not show that this feature "is taught or suggested by" the prior art. (App. Br. 18.) The Examiner relied on Hanna's explicit disclosure that the cellulose and acid could be added to the extruder separately. (FF3.) The Examiner reasoned that "[w]hether the cellulose or depolymerization reagent is added to the extruder first, or whether they are added at the same time, is not considered to be critical, as long as the cellulose and reagent are subjected to extrusion conditions together." (Ans. 10.) We understand the Examiner to be referring to how a person of ordinary skill in the art would have assessed Hanna's disclosure at the time of the invention.

We agree with Appellants that the Hanna disclosure did not explicitly teach or suggest adding acid to the extruder after the cellulose. We acknowledge that Hanna explicitly taught either mixing the acid and cellulose before loading the extruder, or simultaneously adding both to the

extruder. (FF3.) Other than denying there was a suggestion to add the depolymerizing reagent after the cellulose was put in the extruder, Appellants have not explained why the Examiner was wrong to find that one of skill in the art would have considered the order of addition a non-critical feature of combining the Hanna and Schaible teachings. We conclude the Examiner gave a reasonable analysis of how one of ordinary skill in the art would have understood the prior art disclosures, and that Appellants have not rebutted it.

Claims 14, 16, and 17

Claim 14 defines a process “wherein . . . the cellulose material comprises about 30% to about 50% by weight of the reaction mixture.” The Examiner’s Answer provided a calculation to show that Schaible’s Example 7 processed cellulose in a reaction mixture that was “about 40%” cellulose by weight, thus guiding the artisan to process cellulose at a value in the range 30-50%. (Ans. 10-11.)

Appellants dispute the facts on which the Examiner based the calculation, and dispute the correctness of the calculation result. (Reply Br. 7.) We agree that the evidence supports Appellants’ points that (i) the total volume of Schaible’s reaction mixture was 3 L, not 1 L as the Examiner found, and that (ii) the Examiner’s calculated result of 40% was wrong because the result would be about 1.3% when the correct volume is used.

We conclude that the evidence provided in the Examiner’s Answer was insufficient to establish obviousness for claim 14. As claims 15-17 are dependent on claim 14, the rejection of those claims is also reversed. Because we reverse the rejection of claims 16 and 17 based on their

incorporation of claim 14's "about 30% to about 50%" limitation, we do not need to address Appellants' arguments about the obviousness of the residence times recited in claims 16 and 17. (*See* App. Br. at 18-19.)

We note that claim 24 is directed to "[t]he microcrystalline cellulose produced by the process of claim 14." Appellants did not separately argue claim 24, did not argue that claim 24 should be grouped with claim 14, and did not provide an argument or evidence that the microcrystalline cellulose produced by claim 14's method is different from known or obvious microcrystalline cellulose. We do not find that there would be a difference. *See e.g., In re Thorpe*, 777 F.2d 695, 697 (Fed. Cir. 1985) ("If the product in a product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process."). We conclude that the obviousness of claim 24 is distinct from the obviousness of claim 14, and not negated by reversing the rejection of claim 14. We rely on our discretion under 37 C.F.R. § 41.37(c)(1)(vii) and do not *sua sponte* group claim 24 with claim 14.

B. The Rejection over Hanna, Schaible, Trusovs, and McGinley

Appellants rely on their arguments against the obviousness of claim 1 over Hanna, Schaible and Trusovs. (App. Br. 19.) Their only new argument is that "McGinley et al. does not cure the defects of the primary references discussed above." (*Id.*) We do not agree that the Examiner erred in rejecting claim 1, and we affirm this rejection for the reasons we affirmed the rejection of claim 1.

CONCLUSIONS OF LAW

Appellants have not established that the Examiner erred in concluding that claims 1, 9 and 10 would have been obvious.

Appellants have established that the facts in Schaible's Example 7 were insufficient to support a prima facie case of obviousness for claims 14-17, which define a process "wherein . . . the cellulose material comprises about 30% to about 50% by weight of the reaction mixture."

SUMMARY

We affirm the rejection of claims 1-13, 20, 22-24, 26 and 28 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of Hanna, Schaible, and Trusovs;

we reverse the rejection of claims 14-17 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of Hanna, Schaible, and Trusovs; and

we affirm the rejection of claims 18-21, 25-27 and 29-31 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of Hanna, Schaible, Trusovs, and McGinley.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED-IN-PART

Appeal 2009-009621
Application 10/521,886

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